Research Article

ROE

ECNU Review of Education
2023, Vol. 6(2) 294–317

DOI: 10.1177/20965311221143797
journals.sagepub.com/home/roe

Sage

ECNUP

China Medical Education College Survey, 2013–2018

You You (由由), Nali Jia (贾娜丽), Ana Xie (谢阿娜), and Weimin Wang (王维民)
Peking University

Abstract

Purpose: China recently proposed a series of important policies intended to reform and improve the quality of medical education on the national level. This paper presents the findings of a national survey of China's medical schools conducted to review the development of undergraduate medical education over a five-year period (2013–2018).

Design/Approach/Methods: The National Center for Health Professions Education Development implemented the China Medical Education College Survey. Approximately 64% of the targeted medical schools participated in the survey, constituting a representative sample of higher education institutions offering educational programs in clinical medicine in China.

Findings: Following new policy orientations, medical schools showed positive developments in terms of the types of medical education programs offered, teaching and assessment methods, medical education resources, participation in accreditation, and quality of incoming students. However, the survey also revealed several worrying trends, including the coexistence of various types of education programs, significant regional differences in educational resources, dominance of traditional teaching and assessment methods, inconsistencies in quality, and an increase in graduates seeking employment in professions outside healthcare.

Originality/Value: Findings of the first national survey of China's medical schools show that there is still a long way to go to ensure high quality and efficient medical education on a national level.

Corresponding author:
Weimin Wang, Institute of Medical Education & National Center for Health Professions Education, Peking University, Beijing 100191, China.
Email: wwm@bjmu.edu.cn

Keywords

China, college survey, development trends, higher education, undergraduate clinical medicine

Date received: 14 October 2021; revised: 20 June 2022; accepted: 13 July 2022

The health indicators of China's population have improved continuously since the founding of the People's Republic of China, with the main indicators now above the averages of high-income countries (Information Office of the State Council of the People's Republic of China, 2019). Medical education has played a key role in this achievement. With the reform and development of the economy and society's healthcare needs, medical education in China adopted continuous learning and referenced international experiences. After completing this process of imitation, exploration, and self-construction, China established its own development model for medical education—one comprising its own system and teaching methods and containing unique Chinese characteristics. In the 21st century, Chinese higher education began striving toward the stage of popularization. However, popularizing higher medical education conflicts with its inherently elite nature. Many problems arising from this contradiction have become apparent over time, prompting increasing focus on the quality of medical education.

Upon entering the new era of the country's goal of building a moderately prosperous society in all respects, China published a series of policy opinions on reforming clinical medicine (CM) education.[1] More specifically, China seeks to establish and improve the country's system of accreditation in medical education so that it contains Chinese characteristics while being equivalent to international standards. The Excellent Doctor Education and Training Program (EDETP) was implemented as a starting point to guide all colleges in their provision of education and the reform of their teaching and management systems. The aim was to comprehensively enhance the quality of training for medical personnel, optimize that training structure, and have the medical and education sectors jointly promote the reform and development of medical education to satisfy the country's medical and healthcare needs. The bases for evaluating policy effectiveness in the context of national policy orientations include: (i) identifying changes that have occurred in China's undergraduate CM education over the recent years; and (ii) determining whether these changes are consistent with the policy orientations, foreseen or unforeseen, and conducive to improving the training quality of medical personnel and satisfying the country's needs for medical and healthcare services. These issues are also closely related to the attainment of health for the entire population, making them general concerns shared by all sectors of society.

In June 2019, the Ministry of Education's (MOE) Higher Education Division directed the National Center for Health Professions Education Development (NCHPED) to conduct the inaugural China

Medical Education College Survey (CMECS). This initiative was implemented in conjunction with the Working Committee for the Accreditation of Medical Education (WCAME) and the Steering Committee for the Teaching of Clinical Medicine in Higher Education Institutions, both of which are under the MOE. The survey was designed to gain an overall understanding of the country's higher education institutions (HEIs) that offer undergraduate CM courses and their operating situations. This study examines the data collected by the CMECS according to the framework of the context, input, process, and product (CIPP) evaluation model. More specifically, this study compiles and examines the developments and changes in various aspects of China's undergraduate CM education between 2013 and 2018, including educational projects, resources, management, teaching and evaluation methods, education, sources of students, and graduate prospects. Examining the findings of the CMECS in light of national policy orientations, this study evaluates the role of China's top-down education governance system in promoting the development of medical education in the country.

The CMECS

Survey participants

The CMECS participants were HEIs in China that offer undergraduate CM education programs (hereinafter, medical colleges); however, military academies and independent colleges were excluded. There were 161 medical colleges in the country as of June 2019.[2] Participants were categorized by type of discipline as follows: (i) the medical colleges (departments or centers) of comprehensive universities; (ii) medical universities and colleges; and (iii) HEIs other than the other two categories. In terms of hierarchy, the survey participants included double first-class universities (first-ranked universities in terms of both global ranking and academic discipline development), first-class universities in terms of academic discipline development, and general undergraduate colleges.

Design framework

The CMECS regarded medical colleges as organic systems in the "real world," where experimental designs are difficult to use for evaluation. Therefore, the survey was based on the CIPP model, which has been widely applied in the education sector (Fitzpatrick et al., 2011; Lovato & Peterson, 2018). The CIPP model is a comprehensive practical approach oriented toward improvement and accountability: Context evaluation addresses the basis for the setting of goals and objectives, Input evaluation examines the resources required to achieve the specified goals and objectives, Process evaluation asks questions about the implementation of plans, and Product evaluation assesses both the intended and unintended outcomes. With the national policies that governed the medical colleges and programs (e.g., their operating objectives) serving as the Context, the survey collected data from medical colleges regarding the various Input (i.e., financial and

human resources), Process (i.e., governance structure, education plans, curricular, teaching methods and technologies, school policies, management, quality assurance), and Product (i.e., students and educational outcomes) factors (Meng, 2018; Min, 2001; Zhan, 2012).

Regarding the various factors measured by the CMECS, the questions were designed to highlight the characteristics of China's medical education while drawing on international experiences. On the one hand, the survey design referenced those developed by more mature organizations such as the Integrated Postsecondary Education Data System (IPEDS) survey (National Center for Education Statistics, US [NCES], 2019) and the institutional survey developed by the American Association of Medical Colleges (AAMC) in the United States (Barzansky, 2010; Flexner, 1910; Manlove et al., 1953). On the other hand, the design incorporated the indicators stipulated by the *Accreditation Standards for Basic Medical Education in China (2016 Edition)* (hereinafter, the 2016 accreditation standards), as well as the quality monitoring indicators discussed and agreed upon by experts in medical education. In addition to understanding the current situation of medical education, the CMECS focused on the changes introduced to medical education by the various medical colleges in the five years prior.

Survey method

The CMECS was conducted online for convenience and ease of completion. The questionnaire was divided into 12 submodules. The participating medical colleges were required to identify an overall survey coordinator and those responsible for each submodule. The overall coordinators were responsible for all communication matters concerning the survey, coordinating the completion of the respective submodules, summarizing and reviewing the information provided by their respective colleges, and completing the online questionnaire for submission. The survey was conducted from June 25, 2019, to September 10, 2019.

To help medical colleges understand the survey questions and complete the survey, the questionnaire was piloted with the directors of various administrative departments in one medical school. Feedback drew attention to terms used in the survey questions that needed to be clarified; accordingly, definitions were provided in the question notes of the online survey. Wherever possible, terms were defined according to definitions used in the data instruments developed by the MOE's Higher Education Evaluation Center (HEEC) as well as in the 2016 accreditation standards in CM, with which medical colleges had prior experience. There were "save" and "resume" buttons on each page of the online survey, allowing respondents to pause when necessary so that they could consult their own archived material or seek additional sources of information. College coordinators were given a PDF version of the survey questions with a link to the online survey; this enabled survey respondents from various administrative departments in the same college to gain familiarity with the survey questions and discuss the division of group work before formally completing the online survey.

The first page of the survey questionnaire provided general instructions explaining the scope of the survey and emphasizing that the data provided should pertain to the college situation for 2013 and 2018. Instructions noted that the coordinators were responsible for data consistency across survey sub-modules. However, specific measures were also embedded in each survey question to automatically check the internal consistency of data. Moreover, during the online survey period, researchers ran an informational group chat on WeChat, a free social networking application widely used in China. In addition to providing instructions, this WeChat group was used to provide participants with updates and answer all questions in a timely manner.

Ethical statement

The CMECS was conducted following core ethical principles. For example, informed consent was obtained from participating colleges after explaining that their survey responses would be used for research purposes under the *Statistics Law of the People's Republic of China*. All participating colleges were made explicitly aware that their participation was entirely voluntary and had the right to withdraw at any time.

Sample representativeness

A total of 103 medical colleges participated in the survey. Compared with the country's undergraduate colleges offering CM education programs, participants had the same distribution in terms of region, hierarchy, type of discipline, academic system, and EDETP pilot sites. Therefore, the samples were representative (see Table 1 and Figure 1).

Survey results

The questionnaire survey was broad and varied in terms of content. However, due to space limitations, selected indicators were extracted for preliminary summary and analysis. First, program types were illustrated as the general context for CM education. Second, indicators with typical CM characteristics—such as financial resources, faculty, teaching facilities, libraries, curricula, and practical classes—were selected as inputs. Third, teaching methods, education techniques, assessment approach, and external and internal quality assurance activities were employed to demonstrate teaching and management processes in CM education. Finally, student quality and graduate employment were used as product indicators of CM education.

Diversification of CM education programs

Medical colleges in China have provided a variety of CM education programs in accordance with the national conditions and their respective developmental positioning and operating conditions. On

Table 1. Representativeness of sampled medical colleges.

Medical colleges	Sampled	National
Total number	103	161
	%	%
Distribution by region in China		
Eastern	41.75	45.34
Central	33.01	30.44
Western	25.24	24.22
Distribution by hierarchy		
Double first-class	13.59	14.91
First-class	8.74	10.56
General	77.67	74.53
Distribution by type of discipline		
Comprehensive	58.25	54.04
Medical	41.75	41.61
Others	2.90	4.35
Distribution by academic system of education programs		
Five-year courses	72.81	77.02
Integrated courses	20.39	16.15
Eight-year courses	6.80	6.83
Distribution by EDETP pilot sites		
Non-sites	36.89	40.37
Sites	63.11	59.63

Note. Sources of national data include: (1) the official list of higher education institutions (2019) from China's MOE (https://www.moe.gov.cn/jyb_xxgk/s5743/s5744/A03/201906/t20190617_386200.html), (2) the national directory of medical schools from the National Center for Health Professions Education Development (https://medudata.meduc.cn/page/detail/615417e2b4d5221acea4a355), and (3) China Directory of Medical Schools (2018–2019) compiled by Lin and Lou (2019).

average, each sampled college offered 2.88 undergraduate CM education programs. Regarding participant type, medical universities and colleges offered the most programs (3.92), followed by comprehensive universities (2.13), while HEIs classified as "others" offered the fewest programs (1.33). In respect to the length of the programs, five-year programs predominated, constituting 75% of the total. Of the remaining programs, "5 + 3,"[3] six-, and eight-year programs accounted for 9.64%, 8.21%, and 6.79%, respectively, while seven-year programs accounted for just 0.36% (see Figure 2).[4]

Regarding program direction, participants provided both general and specialist CM programs, the latter including specialization in pediatric medicine, medical imaging, anesthesiology, psychiatry, optometry, and general medicine. Sampled institutions also offered programs of excellence and

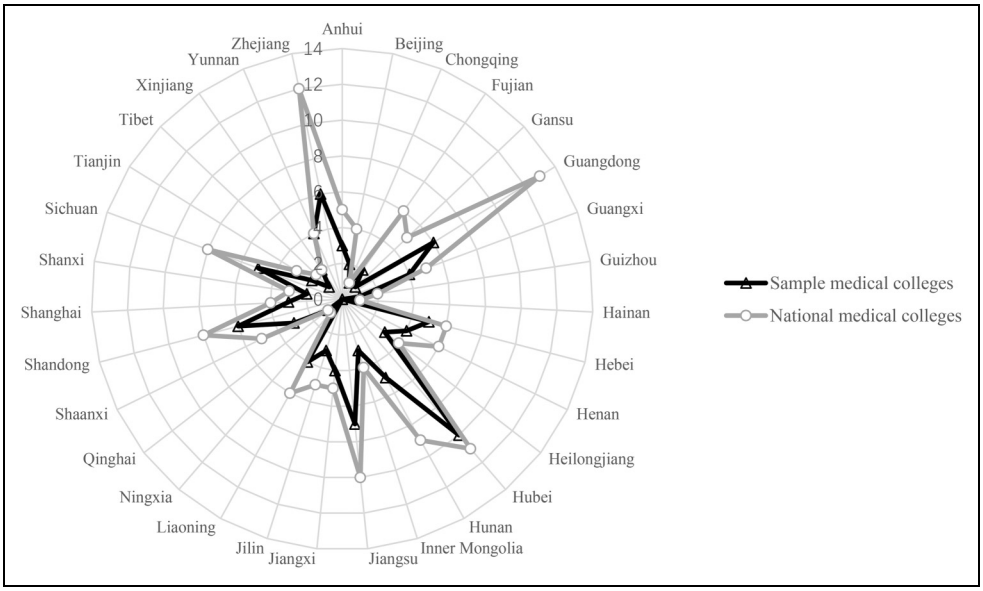

Figure 1. Regional distribution of sampled medical colleges.

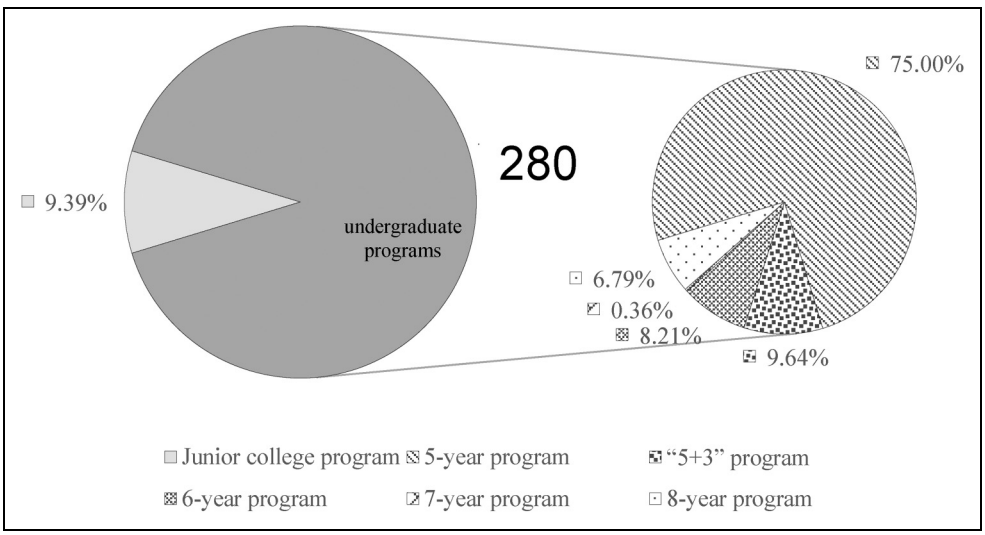

Figure 2. The CM education programs (%) provided by the sampled institutions.

programs catering to those intending to practice in rural areas (hereinafter, rural-oriented programs) and foreign students. More than 50% of CM programs were general programs (i.e., did not have a specialization), approximately 17% were for specializations with personnel shortage, 2.15% were rural-oriented programs, and 3.58% were programs of excellence. As Table 2 shows, high-end

Table 2. Direction of CM education programs (%).

Education program	Vs. all education programs	Vs. colleges' largest-scale education programs	Vs. colleges' highest-quality education programs
CM	50.90	80.90	81.58
CM (rural-oriented)	2.15	1.12	1.32
CM (pilot sites of excellence)	3.58	0.00	10.53
CM (personnel shortage)[a]	16.85	4.49	3.95

Note. [a]These included pediatrics, geriatrics, general medicine, and obstetrics and gynecology.

programs had large proportions of general programs and programs of excellence. The length and direction of these programs reflect that the sampled medical colleges had implemented the government's demand to broaden collaborations in medical education to promote its reform and development.

Improved but uneven distribution of educational resources

The educational resources of medical colleges serve as guarantees for improving the quality of medical education. This section summarizes the survey findings regarding the level of educational resources in medical colleges in terms of financial resources, human resources, facility resources, and curriculum and practical resources, as well as the changes that have occurred in these spheres.

The total national funding inputs in higher education and per-student expenditure have increased continuously over the last five years (MOE, 2019), as have the financial resources of medical colleges. The CMECS results indicated that the total incomes and expenditures of medical colleges increased significantly between 2013 and 2018 (see Figure 3).[5] However, the growth in financial resources differed depending on the hierarchy of the medical college. More specifically, double first-class universities had greater financial resources in absolute terms, as well as faster rates of growth for those resources, than first-class universities and general undergraduate colleges. The survey also revealed significant regional variations, with colleges in eastern China having the highest absolute level of financial resources while those in central China exhibiting the slowest growth rate of such resources.

Training and nurturing medical talents is an arduous and costly process. Accordingly, central and local governments have increased their inputs in medical education through multiple channels. Since 2012, the central government has raised the per-student funding standard for medical undergraduates from RMB 14,000 to RMB 27,000.[6] Although the findings of the CMECS confirm that the level of per-student funding received by medical colleges increased between 2013 and 2018, the allocation has been inconsistent. More specifically, during implementation, a considerable proportion of medical colleges did not receive per-student funding at the national standard (see Figure 4). In addition, the proportion of "under-funded" colleges exhibited a trend of gradual growth from eastern to western China.

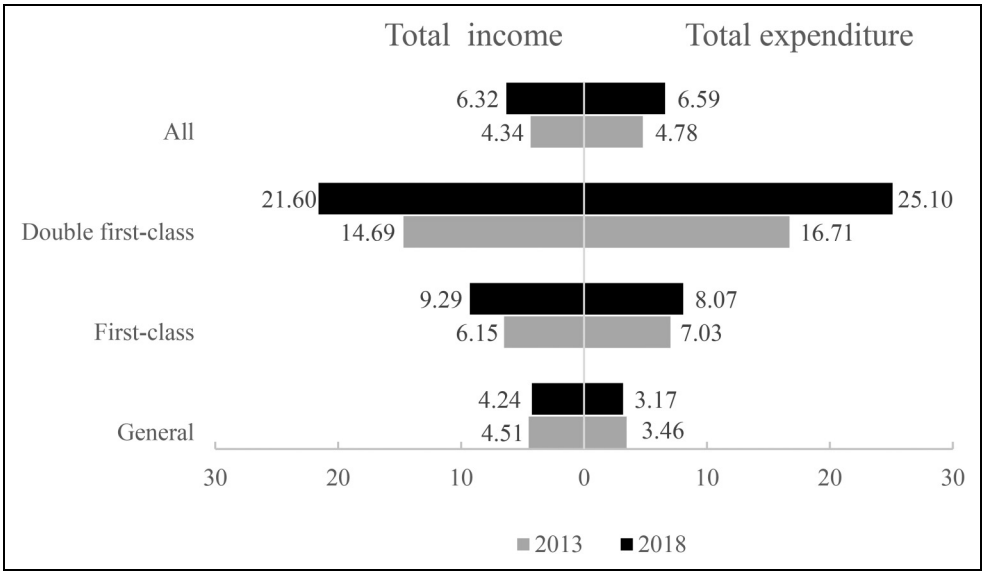

Figure 3. Total income and expenditure of medical colleges.

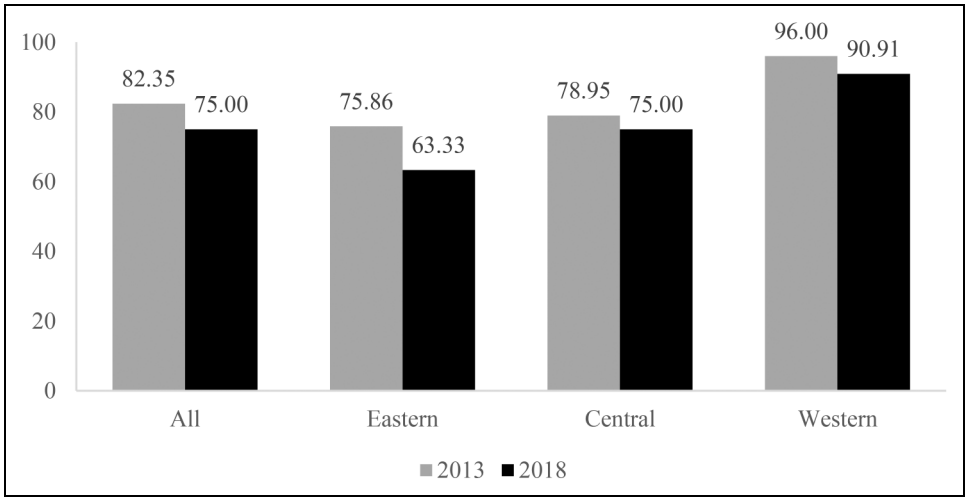

Figure 4. Medical colleges that did not reach the per-student funding level of RMB 27,000 (%).

Medical teachers are the most important resource of medical education, with inputs by high-quality teachers' key to improving medical education quality. In terms of the overall academic and professional titles of faculty members of the sampled medical colleges, the proportions of teachers with doctoral qualifications and senior titles increased between the 2013–2014 and 2018–2019 academic years (AYs) (see Table 3).

Table 3. Resources of the medical colleges: Faculty.

	Basic stage		Clinical stage	
AY	2013–2014	2018–2019	2013–2014	2018–2019
Proportion of faculty with doctoral degrees				
Average of all medical colleges (%)	35.72	47.49	30.83	37.09
Relative regional difference (%)[a]	70.10	65.34	45.12	35.04
Proportion of faculty with senior professional titles				
Average of all medical colleges (%)	48.79	54.56	49.00	50.82
Relative regional difference (%)[a]	9.22	14.00	18.76	13.87
Proportion of faculty with senior professional titles teaching undergraduate programs				
Average of all medical colleges (%)	40.63	46.28	42.33	49.03
Relative regional difference (%)[a]	8.25	12.08	35.77	18.93
Proportion of clinical teachers teaching at the basic stage of medical education				
Average of all medical colleges (%)	8.07	12.17	/	/
Relative regional difference (%)[a]	43.49	32.54	/	/

Note. [a]In addition to the average of all medical colleges, the averages of those in eastern, central, and western China were also calculated. Relative regional difference = (Highest regional value − Lowest regional value)/Average value × 100.

Improvements in educational qualifications were more evident than those in the professional title. Regarding the basic stage of medical education, results show that both the educational qualifications and professional titles of faculty members improved. Meanwhile, in the clinical stage, the educational qualifications of the faculty had improved, while the professional title structure remained relatively stable. With respect to the teaching staff of undergraduates, the proportion of faculty with senior professional titles at both the basic and clinical stages showed an increase, as did the proportion of clinical teachers at the basic stage. The aforementioned disparities in human resources also exhibited regional variations, particularly with respect to the interregional differences in the educational level of the overall teaching faculty.

Facility resources for CM education include teaching laboratories, clinical teaching bases, and medical libraries. Survey results indicated that between AYs 2013–2014 and 2018–2019, there were substantial increases in the floor area of teaching laboratories, value of instruments and equipment, and number of teaching programs conducted (see Tables 4 and 5). There were also significant increases in the floor area of libraries, volumes of related book collections, and number of databases. However, for the clinical teaching bases, there were no increases in the per-student area of dedicated teaching rooms and per-student number of teaching beds. In terms of the regional distribution of the aforementioned facility resources, colleges in central and western China showed slight advantages pertaining to the physical area of their facilities. Nevertheless, colleges in

Table 4. Resources of medical colleges: Teaching laboratories.

	Basic medicine		Clinical skills	
AY	2013–2014	2018–2019	2013–2014	2018–2019
Total area				
Average of all medical colleges (m^2)	4839.44	5442	2638	5450
Relative regional difference (%)[a]	20.79	33.80	5.95	16.84
Total value of instruments and equipment				
Average of all medical colleges (RMB 10,000)	1327.24	2569	800	2398.77
Relative regional difference (%)[a]	34.11	26.76	73.2	92.35
Teaching experiment programs conducted				
Average of all medical colleges (no.)	223.55	259.15	103.1	128.11
Relative regional difference (%)[a]	7.81	11.58	21.60	36.92
Proportion of teaching experiment programs involving comprehensive and innovative experiments				
Average of all medical colleges (%)	36.12	44.19	50.61	61.16
Relative regional difference (%)[a]	38.07	23.20	74.19	52.91

Note. [a]In addition to the average of all medical colleges, the averages of those in eastern, central, and western China were also calculated. Relative regional difference = (Highest regional value − Lowest regional value)/Average value × 100.

Table 5. Resources of medical colleges: Clinical teaching bases and libraries.

	Clinical teaching bases		Libraries	
AY	2013–2014	2018–2019	2013–2014	2018–2019
	Per-student teaching bed (no.)		*Total floor area (m^2)*	
Average of all medical colleges (%)	3.32	3.05	16872.25	23171.00
Relative regional difference (%)[a]	15.36	17.70	33.44	52.19
	Per-student teaching area (m^2)		*Books [b] (10,000 volume)*	
Average of all medical colleges (%)	11.77	11.12	26.97	38.86
Relative regional difference (%)[a]	18.35	13.04	49.61	35.87
			Electronic databases (no.)	
Average of all medical colleges (%)	/	/	36.99	55.98
Relative regional difference (%)[a]	/	/	41.50	43.89

Note. [a]In addition to the average of all medical colleges, the averages of those in eastern, central, and western China were also calculated. Relative regional difference = (Highest regional value − Lowest regional value)/Average value × 100.
[b]Collection of books on biology, medicine, and healthcare.

eastern China enjoyed advantages regarding the equipment value within their facilities, as well as resources in the form of book collections and databases.

Curriculum and practical classes are the primary means through which the various resources of a medical college are transformed into the learning effectiveness of its students. In terms of the curriculum model, the survey found that the credit hours and points allocated to subject-based courses comprised the bulk of the curriculum (see Table 6). However, the proportion of credit hours and points allocated to such courses in AY 2018–2019 had declined compared to AY 2013–2014, having been replaced with problem- and organ systems-based and competency-oriented courses. In respect to resources for experimental classes, the per-student usage of experimental animals had increased between the two AYs, although the per-student usage of cadavers for anatomy classes remained relatively consistent. Regarding practical classes, the duration of internship and practice in primary health service institutions and the proportion of students who had opportunities to participate in overseas exchange increased between the two AYs (see Table 7). A significant number of interregional differences were apparent in the aforementioned courses and practical resources. For example, colleges in eastern China tended to reduce more credit hours allocated to subject-based courses while exploring the value of competency-oriented courses. In contrast, there was no obvious reduction in credit hours allocated to subject-based courses by colleges in central and western China. Concurrently, colleges in western China offered relatively more organ systems-based courses.

Table 6. Resources of medical colleges: Curriculum.

	Credit hours		Credit points	
AY	2013–2014	2018–2019	2013–2014	2018–2019
Subject-based courses				
Average of all medical colleges (%)	2242.61	2053.29	172.50	165.12
Relative regional difference (%)[a]	25.33	11.82	3.37	3.79
Problem-based courses				
Average of all medical colleges (%)	65.05	97.88	5.19	9.66
Relative regional difference (%)[a]	169.10	118.54	139.34	85.28
Organ systems-based courses				
Average of all medical colleges (%)	162.07	171.74	14.88	18.18
Relative regional difference (%)[a]	140.56	187.61	143.17	158.09
Competency-oriented courses				
Average of all medical colleges (%)	710.67	749.02	36.62	41.00
Relative regional difference (%)[a]	63.65	85.73	70.68	55.91

Note. All data in this table were based on the largest-scale training and education program conducted by each medical college.
[a]In addition to the average of all medical colleges, the averages of those in eastern, central, and western China were also calculated. Relative regional difference = (Highest regional value − Lowest regional value)/Average value × 100.

Table 7. Resources of medical colleges: Practical classes.

	Practice resources			
AY	2013–2014	2018–2019	2013–2014	2018–2019
	Per-student usage of experimental animals (no./year/person)		*Duration of internship/practice in grassroots healthcare services institutions (weeks)*	
Relative regional difference	2.97	7.01	0.75	0.61
All medical colleges	4.35	5.64	1.44	1.8
	Per-student usage of cadavers for anatomy classes (no./year/person)		*Proportion of students with opportunities for overseas exchanges (%)*	
Relative regional difference	0.02	0.02	5.2	7.99
All medical colleges	0.03	0.03	3.6	6.63

Gradual reduction in traditional means of teaching and evaluation

The progress of society, technology, and medical knowledge poses considerable challenges to the traditional model of medicinal education and teaching, which predominantly emphasizes the imparting of knowledge. Accordingly, the teaching methods, educational technologies, and corresponding assessment techniques and evaluation methods for CM have changed. The CMECS collected information on the teaching methods, educational technologies, assessment techniques, and evaluation methods employed by medical colleges at the basic and clinical stages of CM education for AYs 2013–2014 and 2018–2019, using these data to identify and compile any changes that had occurred. Figure 5 shows the average utilization of various teaching methods. Although the application of problem-based learning (PBL), case-based learning (CBL), and team-based learning (TBL) increased consistently, traditional lecture-based learning (LBL) remained the dominant teaching method at both the basic and clinical stages.

Traditional teaching techniques in CM education include the use of audiovisual images, collections of illustrations/models, biological specimens/samples on slides, experimental animals, and multimedia. These techniques are used extensively in higher education, including medical education. With advancements in information technology, the application of modern techniques including computer-aided simulation, virtual, and remote learning in medical education has increased. According to the survey, multimedia educational technologies were the most commonly applied technique by the sampled medical colleges at both the basic and clinical stages (see Figure 6). A comparison of AYs 2013–2014 and 2018–2019 revealed that the application of both traditional and modern educational technologies had improved, indicating diversification in utilizing educational technologies.

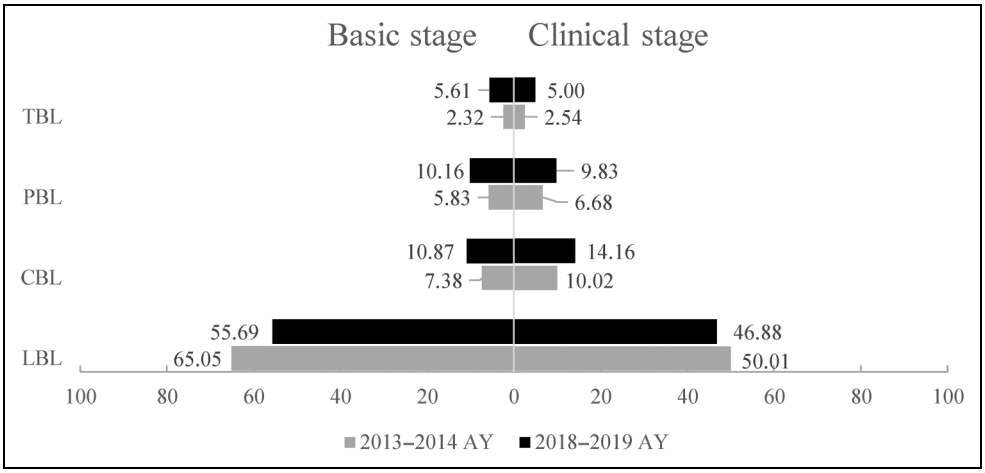

Figure 5. Teaching methods utilized in medical colleges (%).

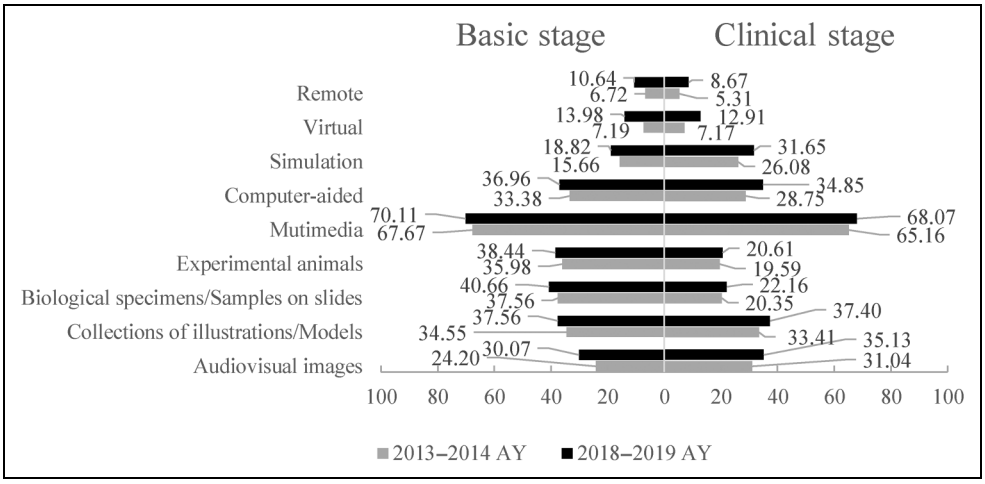

Figure 6. Educational technologies utilized in medical colleges (%).

Teaching quality is primarily evaluated through assessments. Additional CM knowledge, skills, and attitudes are mainly assessed via two types of examinations: namely, theoretical and skill-based examinations. The survey found that theoretical examinations at the basic and clinical stages used similar assessment techniques, including interviews, written examinations, and essay writing. These techniques were often combined with the use of computers and the Internet. Skill-based examinations for both stages involved experimental operations. The objective structured clinical examination (OSCE), mini-clinical evaluation exercise (Mini-CEX), direct observation of procedural skills (DOPS), and computer-based case simulation (CCS) were also used for skill assessment

examinations at the clinical stage. Among the sampled colleges, written examinations and experimental operations were the primary assessment techniques at both the basic and clinical stages (see Table 8). However, the use of written examinations declined between the two AYs, while examination techniques combining computers and the Internet became more prevalent. Moreover, while the use of OSCE for skill-based examination at the clinical stage increased to some extent, mini-CEX, DOPS, and CCS remained less frequently used.

In terms of purpose, assessment methods can be divided into diagnostic, formative, and summative evaluations. The 2016 standards encouraged medical colleges to use formative evaluation in CM education to improve teaching quality. Among the sampled colleges, summative evaluation was the dominant assessment method at both the basic and clinical stages, followed by formative evaluation and then diagnostic evaluation (see Figure 7). A comparison of the AYs 2013–2014 and 2018–2019 reveals that the use of summative evaluation declined while formative evaluation increased. This finding aligns with the direction promoted by the accreditation of CM education.

More than half of the medical colleges have achieved full accreditation for CM education

Comprehensively improving the training quality of medical education talents is inseparable from establishing a complete education quality assurance system. The Chinese government uses external quality assurance methods—such as quality assessment and accreditation—to evaluate the colleges' performance of their duties. In turn, colleges supervise and manage the quality of their internal activities, thereby forming an internal quality assurance mechanism (Liu & Li, 2019).

Table 8. Assessment techniques utilized in medical colleges (%).

	Basic stage			Clinical stage	
AY	2013–2014	2018–2019	AY	2013–2014	2018–2019
Interview	1.71	2.17	Interview	2.00	2.50
Written examination	71.55	60.53	Written examination	64.29	50.13
Essay writing	2.88	4.88	Experimental operations	14.60	14.98
Computer (single machine)	1.56	4.35	OSCE	5.96	13.94
Internet	1.61	5.45	Mini-CEX	1.37	4.02
Experimental operations	17.85	21.65	DOPS	4.21	7.11
Others	0.64	0.90	CCS	1.28	3.09
/	/	/	Others	1.02	1.99

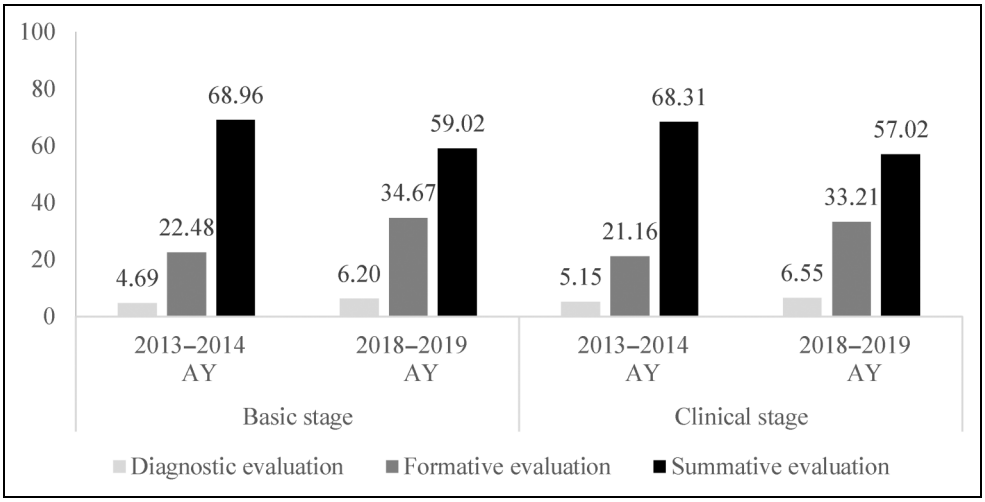

Figure 7. Assessment methods utilized in medical colleges (%).

Since its formal implementation in 2008, the accreditation of CM education in China has gradually aligned with international practices in terms of standards, procedures, and processes (Xie et al., 2012). A significant milestone in the history of China's medical education occurred in June 2020, when the World Federation of Medical Education (WFME) recognized the WCAME as an agency that accredited medical schools at an internationally accepted and high standard. This marked a major step forward in the country's efforts to establish and implement a system of accreditation for CM education with both Chinese characteristics and international substantive equivalence.

Among the sampled colleges, 56.8% had received full accreditation for CM education (see Figure 8). In terms of hierarchy, a greater proportion of double first-class universities had received the accreditation of CM education (69.2%) compared to the other types. Relatively similar proportions of first-class universities and general undergraduate colleges had been accredited, with the former only slightly higher than the latter at 55.6% and 54.8%, respectively. A higher proportion of medical universities and colleges were fully accredited (61.5%) compared to comprehensive universities (55.80%). According to survey results, no HEIs categorized as "others" was fully accredited.

In respect to the internal quality assurance of medical colleges, the CMECS collected information regarding the revisions to colleges' objectives and training plans for nurturing medical talents, as well as the teaching evaluations, reforms, and educational research conducted (see Table 9). The sampled colleges reviewed and updated their training objectives and plans regularly. On average, colleges reviewed their training plans and objectives every 3.74 and 4.15 years, respectively. The frequency of reviews was much higher in double first-class universities than in first-class

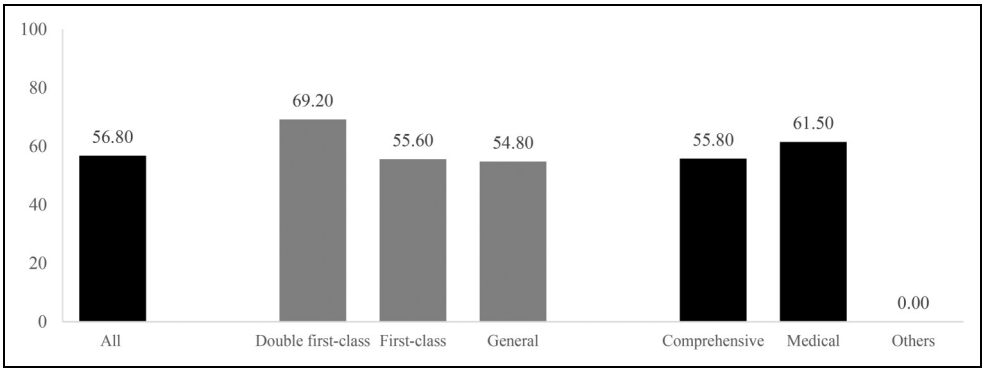

Figure 8. Medical colleges with full accreditation for CM education (%).

universities and general undergraduate colleges. Colleges with full accreditation of CM education conducted reviews less frequently than those who had yet to complete accreditation.

The sampled colleges conducted a round of teaching evaluation every 1.3 years on average. However, the frequency of evaluation by general undergraduate colleges was below this average, whereas that by double first-class and first-class universities was above it. Medical colleges without full CM accreditation conducted teaching evaluations less frequently than those that were fully accredited. The sampled colleges implemented educational and teaching reforms every 2.13 years on average. This frequency did not vary much between colleges of different hierarchies and types, although colleges without full accreditation of CM education conducted reforms more frequently than fully accredited colleges.

Another important component of the internal quality assurance system of medical colleges is the extent to which the results of their research in medical education can be converted and applied to their own operation and reform. On average, 59.41% of the sampled colleges' educational research results were successfully applied to facilitate the reform of their educational and teaching activities. The conversion rate was the highest for the double first-class universities (70.83%), followed by first-class universities (62.5%) and then general undergraduate colleges (57.9%). Fully accredited colleges exhibited higher conversion rates than those without full accreditation.

Student quality improving, while more graduates choosing jobs outside the healthcare sector

For medical colleges, the quality of their students and prospects of their graduates reflect the results of their talent training. In terms of the source of students, the survey revealed that the ratio of the number of students registered to the planned enrolment number had decreased between AYs 2013–2014 and 2018–2019 (see Figure 9). However, the ratio of the number of first-choice admissions to that of students registered had increased. The percentage of CM undergraduates admitted with an average score exceeding the minimum admission score for key colleges had also increased

Table 9. Internal quality assurance of medical colleges.

		Based on hierarchy of colleges			Based on status of accreditation	
Frequency of conducting each action	All	Double first-class	First-class	General	Not completed	Completed
Revise training objectives (years)	4.15	3.92	4.25	4.18	3.85	4.37
Revise training plans (years)	3.74	3.08	3.89	3.84	3.39	4.00
Evaluate teaching (year/s)	1.30	0.88	0.78	1.44	1.48	1.17
Reform educational teaching (years)	2.13	2.19	2.11	2.11	1.99	2.22
Convert educational research results to serve reforms (%)	59.41	70.83	62.50	57.09	54.70	63.00

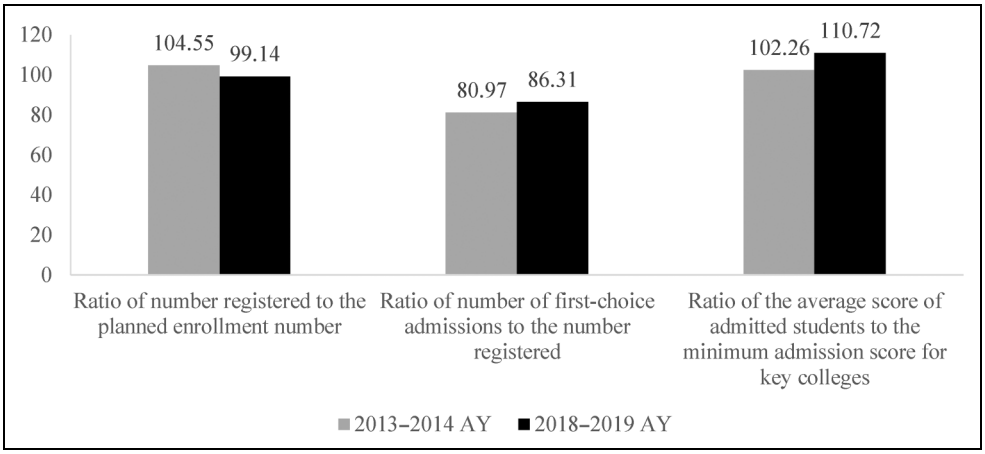

Figure 9. Sources of CM undergraduates of medical colleges.

substantially. These findings indicate that the sampled medical colleges had improved the quality of their student sources while controlling the enrolment scale.

Regarding the prospects of medical graduates, the majority of graduates had found direct employment, followed by those who pursued further studies (see Figure 10). A minority of graduates traveled abroad after studies, while some pursued other prospects. Compared with AY 2013–2014, the proportions of graduates who entered employment, pursued higher education, and went abroad decreased in AY 2018–2019, whereas the proportion who pursued other prospects increased substantially. Moreover, among employed graduates, the proportion of those working in the healthcare sector and as doctors had continued to decline. Although further confirmation of microlevel survey results is required to determine the exact ratio, it appears that an increasing number of medical graduates are not entering the healthcare sector or becoming doctors in accordance with their training expectations.

Discussion and implications

In China's new era, CM education is committed to comprehensively improving the training quality of medical talents. The quality system of medical education was built from the outside in and integrated through the development of accreditation of CM education and promotion of reforms in medical colleges. The preliminary analysis of the inaugural CMECS conducted by the NCHPED in 2019 indicates that, over time, the related institutional arrangements, policies, and reforms aimed at improving quality resulted in some changes in medical colleges. First, in terms of the configuration of the medical education program, the seven-year system was modified and converted to the "5 + 3" system. Medical colleges actively implemented pilot projects for excellence, and some programs were run to address

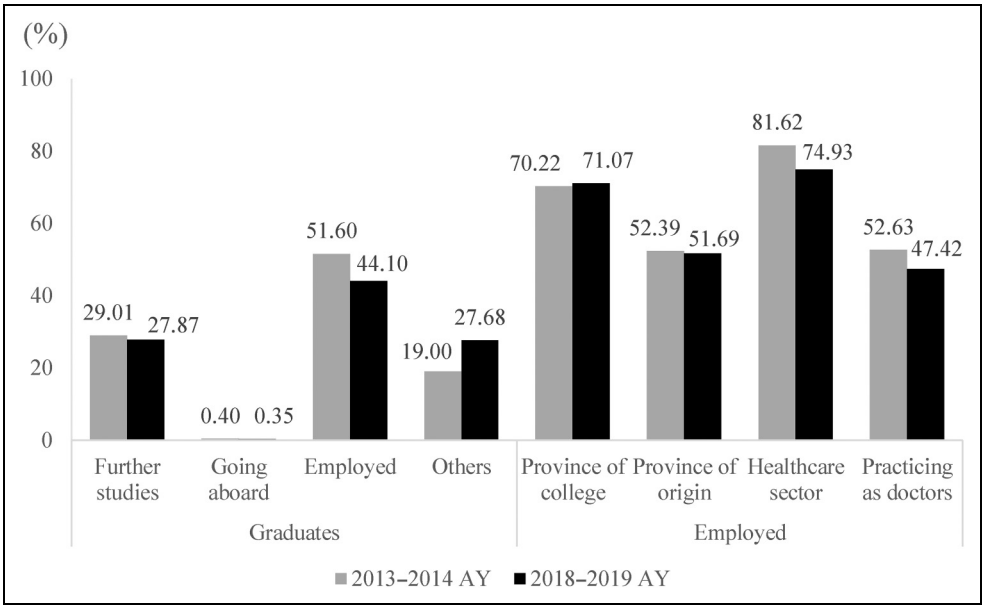

Figure 10. Employment situation of CM graduates of medical colleges (%).

specializations with personnel shortages. Second, investments in educational resources—that is, the personnel, financial, and facility resources of medical colleges—had improved. In terms of the curriculum and practical resources, the proportion of subject-based courses had decreased, organ systems–based courses were gradually introduced, and the provision of competency-oriented courses was explored. Third, regarding teaching and evaluation methods, the use of traditional teaching methods appeared to decline, while that of educational technologies diversified. Written examinations—a traditional evaluation method—were used less frequently; correspondingly, the frequency of applying formative evaluation methods increased. Fourth, in terms of the quality assurance system, the majority of medical colleges were found to have completed or were in the process of completing the full accreditation for undergraduate CM education, with the former category comprising more than half of the total. Under the guidance of accreditation, medical colleges had revised their training targets and plans, teaching evaluations, and educational reforms and research. Fifth, the quality of medical students, measured by the relative level of college entrance examination scores, had improved significantly.

In addition, the CMECS results exhibited several phenomena that merit further attention and discussion.

(i) The co-existence of programs incorporating multiple educational systems and directions should be minimized. The scale of medical education in China is the largest in the

world, and its system is also the most complex (Cai et al., 2015; Hsieh & Tang, 2019). The academic systems still comprise a mixture of the "5 + 3," five-, six-, and eight-year CM educational programs. In addition, some undergraduate colleges offer specialist programs. A large proportion of undergraduate CM education programs have specific professional directions. In this regard, medical colleges need to put further effort into effectively coordinating educational resources to provide educational programs that are distinctive and of high quality. Accordingly, it is recommended that the medical education system be further optimized so that all efforts involved in talent training are collaborated and coordinated to promote quality improvements in talent training.

(ii) The survey revealed clear interregional differences in educational resources. The education funding for general undergraduate medical colleges is generally restricted by local economic development, with the level of and increases in their funding incomparable to that of double first- and first-class universities. Survey results show that medical colleges' funding, teaching faculty, facilities, curriculum, practical classes, and other resource conditions differed significantly across regions. This regional imbalance in the inputs of medical education resources is not conducive to the standardization of undergraduate CM education. Therefore, it is recommended that the government provide further assistance and support to resource inputs for colleges in central and western China, as well as resource guarantees to promote the standardized development of undergraduate CM education.

(iii) The methods used for teaching and evaluation were found to lag behind those being applied globally. Scientific and technological developments have had profound impacts on the teaching and evaluation of medical education. Similar to the rest of the world, China is experiencing rapid changes in science and technology. However, compared to countries with the highest level of medical education, China's undergraduate CM education has not advanced proportionately in terms of teaching and evaluation methods. According to the survey results, although a variety of teaching and evaluation methods have gradually been introduced to China's medical education; traditional methods remain the mainstay in practice. Accordingly, it is recommended that medical colleges explore teaching models centered on student learning, tap the advantages of modern scientific and technological methods, and maximize strengths and avoid weaknesses in order to promote autonomous learning by medical students in the age of information and knowledge explosion.

(iv) Medical colleges that had received full accreditation did not show any advantage in terms of continuously improving their internal quality. The accreditation system of undergraduate CM education is an important component of external quality assurance. If that assurance can promote the formation of an internal quality culture focused on

continuous improvement in medical colleges, it will significantly advance the comprehensive improvement of the quality of medical education. Although the survey found that medical colleges higher up in the hierarchy had devoted significantly greater efforts into internal quality assurance, there is no evidence to indicate that fully accredited medical colleges tended to continuously improve their training objectives and plans or undertake education and teaching reforms due to internal motivation. In fact, it remains unclear whether the external quality assurance system of medical education can fully promote the development of an internal quality system or quality culture in medical colleges. As such, it is recommended that further research be conducted on the mechanism through which the external quality assurance system stimulates medical colleges to form internal motivation for development. Additionally, forming a quality culture that seeks continuous improvement for the various types of medical colleges should be encouraged.

(v) The proportion of medical undergraduates who enter the healthcare sector upon graduation or become practicing doctors has decreased. The formation and improvement of China's continuum in medical education should lead to further alignment between undergraduate and graduate CM education and the standardized training of residents. However, the survey revealed that the proportion of CM majors who pursued further education after graduation remained consistent at best, while that of CM undergraduates who were directly employed upon graduation had decreased. In particular, the number of graduates employed in the healthcare sector or working as doctors had declined further. Therefore, it is recommended that the reason(s) for this phenomenon be analyzed to facilitate effective improvements in talent training by medical colleges.

Acknowledgments

The authors wish to thank Chao Li for her aid in data cleansing and analysis.

Contributorship

You You was responsible for the research design, survey design, approach to data analysis, and writing of the manuscript. Nali Jia conducted the survey, collated the data and figures, and contributed to writing the first draft of the manuscript. Ana Xie mobilized key resources in conducting the survey and contributed to manuscript revision. Weimin Wang secured funding support and contributed to manuscript revision.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical statement

Ethical (IRB) approval for educational research was not typically required in China when our survey was designed and implemented in 2019. However, the CMECS was conducted following core ethical principles: (a) making explicit that participation was voluntary and colleges had the right to withdraw at any time, and (b) obtaining informed consent from participating colleges that their survey responses could be used for research purposes under the *Statistics Law of the People's Republic of China*.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Notes

1. *Several Comments by the MOE and Ministry of Health (MOH) on Implementing a Comprehensive Reform of CM Education* (MOE Higher Education [2012] No. 6); *Comments by the General Office of the State Council on Strengthening the Collaboration Between the Medical and Teaching Sectors to Further Promote the Reform and Development of Medical Education* (Issued by the State Council [2017] No. 63); *Comments by the MOE, National Health Commission, and the National Administration of Traditional Chinese Medicine on Strengthening the Collaboration Between the Medical and Teaching Sectors to Implement the EDETP 2.0* (MOE Higher Education [2018] No. 4).
2. As of June 2019, the directory of the MOE's WCAME listed 161 medical colleges (excluding military academies and independent colleges) providing undergraduate CM education programs in China.
3. The "5 + 3" program refers to a five-year Bachelor of Medicine course in CM plus three years of standardized residency training. Graduates from the "5 + 3" program receive Master of Medicine in CM. It differs from the eight-year program in that graduates from the eight-year program receive Doctor of Medicine in CM.
4. New seven-year programs are not being conducted. However, some seven-year programs are ongoing because existing students have yet to graduate.
5. In the CMECS, the statistics on medical colleges' expenditures were based on the civil year.
6. According to *Several Comments on Strengthening Medical Education and Improving Its Quality* issued by the MOE and MOH on February 20, 2009, the Central Fiscal Authority (CFA) began substantially increasing the per-student funding quota standards for medical undergraduates enrolled in colleges under the Central Ministries in 2008. When allocating funds to relevant special projects, the CFA prioritized medical education programs conducted by colleges under the Central Ministries. The MOE regarded local per-student funding for medical education as an important indicator when approving specializations in medical education.

References

Barzansky, B. (2010). Abraham Flexner and the era of medical education reform. *Academic Medicine*, *85*(9), S19–S25. https://doi.org/10.1097/ACM.0b013e3181f12bd1

Cai, S., Shen, S., Zhang, N., Zeng, J., & Zhao, J. (2015). Analysis on distribution of higher medical education resources in China [in Chinese]. *Medicine & Philosophy*, *36*(12A), 68–71. https://d.wanfangdata.com.cn/

periodical/ChlQZXJpb2RpY2FsQ0hJTmV3UzIwMjIxMTI5Eg55eHl6eDIwMTUyMzAyMRoIbXhueGIxdHY%3D

Fitzpatrick, J., Sanders, J., & Worthen, B. (2011). *Program evaluation: Alternative approaches and practical guidelines* (4th ed.). Pearson.

Flexner, A. (1910). *Medical education in the United States and Canada*.

Hsieh, C. R., & Tang, C. (2019). The multi-tiered medical education system and its influence on the health care market—China's Flexner report. *Human Resources for Health*, *17*(1), 50. https://doi.org/10.1186/s12960-019-0382-4

Information Office of the State Council of the People's Republic of China. (2019). *Press conference on the celebrations for the 70th anniversary of the founding of the People's Republic of China: Meeting the people's new expectations and guaranteeing and improving their livelihoods during development* [in Chinese]. http://www.scio.gov.cn/ztk/dtzt/39912/41837/Document/1665398/1665398.htm

Lin, L., & Lou, Y. (2019). *China directory of medical schools* [in Chinese]. Science Press.

Liu, H., & Li, J. (2019). The quality assurance system of higher education in China: A gestalt approach [in Chinese]. *Educational Research*, *40*(11), 100–110. https://d.wanfangdata.com.cn/periodical/ChlQZXJpb2RpY2FsQ0hJTmV3UzIwMjIxMTI5Eg1qeXlqMjAxOTExMDEwGgh3anA2bzQ0ZA%3D%3D

Lovato, C., & Peterson, L. (2018). Programme evaluation. In T. Swanwick, K. Forrest, & B. C. O'Brien (Eds.), *Understanding medical education* (pp. 443–455). Wiley. https://doi.org/10.1002/9781119373780.ch30.

Manlove, F. R., Anderson, D. G., & Tipner, A. (1953). Medical education in the United States and Canada: 53rd annual report on medical education in the United States and Canada by the Council on Medical Education and Hospitals of the American Medical Association. *Journal of the American Medical Association*, *153*(2), 105–147. https://doi.org/10.1001/jama.1953.02940190031008

Meng, Q. (2018). *Encyclopedia of Chinese medicine: Pedagogy of medical education* [in Chinese]. Peking Union Medical College Press.

Min, W. (2001). On the framework of the running system of higher education under the condition of socialistic market-oriented economy [in Chinese]. *Journal of Higher Education*, *22*(4), 28–34. https://d.wanfangdata.com.cn/periodical/ChlQZXJpb2RpY2FsQ0hJTmV3UzIwMjIxMTI5Eg9nZGp5eWoyMDAxMDQwMDcaCHd3cHZpbHZ0

Ministry of Education of the People's Republic of China (MOE). (2019). *Bulletin on statistics of China's education expenditures for* 2018 [in Chinese]. http://www.moe.gov.cn/jyb_xwfb/gzdt_gzdt/s5987/201904/t20190430_380155.html

National Center for Education Statistics, US (NCES). (2019). *IPEDS survey components*. https://nces.ed.gov/ipeds/use-the-data/survey-components

Xie, A., Wang, W., Cai, J., & Cheng, B. (2012). The establishment and reflection of medical education accreditation in China [in Chinese]. *Chinese Journal of Medical Education*, *32*(6), 801–804. https://d.wanfangdata.com.cn/periodical/yixjy201206001

Zhan, Z. (2012). Innovations in the operating mechanism of higher education from the perspective of the systems theory [in Chinese]. *Academic Exchange*, *221*(8), 202–205. http://www.xsjl.chinajournal.net.cn/WKG/WebPublication/paperDigest.aspx?paperID=185fc2f6-6601-4b1f-9d33-40a2a615d1db